

The Promise of Personalized Medicine

NIH Director Elias A. Zerhouni, M.D., leads the NIH's 27 Institutes and Centers, with more than 18,000 employees and a 2006 budget of \$28.6 billion. A well-respected leader in the field of radiology and medicine, he has spent his career providing clinical, scientific, and administrative leadership. Recently, Dr. Zerhouni sat down with magazine coordinator Christopher Klose to discuss some of Dr. Zerhouni's own experiences and hopes for the future of medicine.

Klose: *What motivated you to become a doctor?*

Dr. Zerhouni: I just like people; the interaction and sense of being relevant. At first, I wanted to be a mathematician or a physicist. I was more interested in rocketry and some of the careers typical of the 1950s. Years later when I was in university, I volunteered in the poor areas. I saw what was going on with the poor and that touched me. That was when I realized that it's great to send rockets to the moon, but perhaps the most important thing is people. That's why I went into medicine.

Klose: *Why did you decide to specialize in radiology?*

Dr. Zerhouni: Sometimes, life is just a matter of encountering people who show you something interesting. I had a radiologist who showed me my first CAT [computed axial tomography] scan.



Right away, I realized this was important; this was something I could do.

Radiology has a direct impact on understanding the biology of disease. Here is the crux of my research. I'm not a biologist but I work in biology, I'm not a mathematician, yet I use mathemat-



ics. Every piece of work I've done has been to increase our ability to quantify – to use quantitative methods – to extract biological information. For example, I first discovered CAT scans could be used to measure calcium density within tissues, which led to my getting a patent. This paved the way for doing the same with lung cancer and then osteoporosis. And I discovered a technique in MRI [magnetic resonance imaging] that allows you to measure cardiac function very precisely.

For me, it has been this constant intermarriage of the physical and biological sciences in which the whole is greater than the sum of the parts.

If you look at the history of medicine, of science in general, we've always gone from being able to empirically observe to being able to measure accurately. The direction has always been to go from less precise to more precise tools, from less to more quantitative data, to inform yourself and increase your knowledge.

Klose: *How would you describe your own approach to research?*

Dr. Zerhouni: I'm sort of a hybrid because I believe that seeing trends is key. I don't like to just analyze things. I'm entrepreneurial and want to make a difference. And that really requires what I would call operational attention. So I'm not really a detail person; details are a tool for reaching endpoints, to drive a particular vision.

Klose: *How do you see medicine today changing?*

Dr. Zerhouni: The relationship between patient and doctor is changing quickly. Before, the patient was passive and receiving, the doctor all-knowing and giving. We tried to cure people of whatever had evolved in them. Now we need to be much more

predictive about what happens to whom, and when, because we're dealing with more long-term, chronic diseases.

Traditional one-size-fits-all treatments must be tailored to the individual because people don't react exactly alike. If we're smart enough, we will be able to preempt disease—to strike it before it strikes the patient.

Klose: *How do you see the doctor-patient evolution coming about?*

Dr. Zerhouni: This will require much more health education, more literacy on the part of patients, and much more communication. Look at heart disease, for example. In the past it was, "If you have chest pain, come and see me." Now it's "If you have high cholesterol you have to watch it; here is the kind you have and what you need to do."

In other words, there is an explanation relationship between doctor and patient. Every time a new element of complexity is added, the need for communication doubles. This is where I think we need to have a multiplicity of media to increase the health literacy of the public.



Klose: *How does this new need for communication affect the future of health literacy?*

Dr. Zerhouni: We are in a revolutionary period of medicine that I call the four Ps: predictive, personalized, preemptive and participatory. This requires patient involvement well before disease strikes. As opposed to the doctor-centric, curative model of the past, the future is going to be patient-centric and proactive. It must be based on education and communication.

This is what I am pushing for at NIH. I like to change things and believe we need to be ahead of the curve. The challenge is to channel the energy of this outstanding organization to help the public better care for itself.

No one knows exactly how to do this. It requires voluntary, intelligent participation, not passive acceptance. We can provide the information, but you have to do something for yourself.

Klose: *How does this new magazine—NIH MedlinePlus—fit into the four Ps model?*

Dr. Zerhouni: MedlinePlus is another link in our changing world, part of the hand-in-hand approach that NIH wants to extend to the public as we both travel this new era of health care – learning and working together.

Klose: *What advice would you offer our readers about the future of health care?*

Dr. Zerhouni: If you want a long and healthy life, take responsibility for yourself. NIH wants to give you the best tools to do that. That's our mission. So, the big thing is: No one has the answer but you. Take responsibility for your care because you can affect it more than any doctor or drug can by doing very simple things, and by knowing where to get more information if what you're doing is not enough.

Take charge with knowledge. We'll give you the knowledge; you provide the power. Knowledge with action is power.

Klose: *What is the prognosis for our ailing health care system?*

Dr. Zerhouni: That's a tough question. What's really amazing is it's not that people don't know or don't have an idea what to do. We know that if we could change behaviors then we could reduce the disease burden; that if you can stick to a diet and an exercise program and maintain certain parameters, such as not smoking, you'd be fine.

We know that prevention is more important than ever, yet the system does not fund prevention. The mystery to me is why the system is so resistant to change.

My total experience as a scientist, then as a science administrator and now as an institutional leader has been about managed change. It's clear to me that this is a revolutionary period of change, and there is no magic answer.

Klose: *What's to be done to improve the health care system?*

Dr. Zerhouni: Just like anything else, it is going to take the ability to free up the American genius in adapting itself to a challenge. Right now, everyone's focused on finding the magic answer. But health care is different from region to region across the country. We need to give people the degrees of freedom they need to experiment with different health care solutions.

We need to get back to the genius of our country. The more we free our ability to do that, the more we make sure that we don't become so bureaucratic and so rigid that there is only one solution – the one we've used for 50 years that says, "Well, we've been doing this for 50 years, it's worked! We're great! We're wonderful! Why don't we just rest on our laurels? Why try something else?"

The NIH must serve as the source of the most credible knowledge. Not to spoon-feed people, but to empower them to feel that there is no limit to what they can achieve for themselves in their own health — just like there is no limit to what you can achieve in this country.